

**Advice to the Minister for the Environment, Heritage and the Arts
from the Threatened Species Scientific Committee (the Committee)
on Amendment to the list of Threatened Species
under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

1. Scientific name (common name)

Sarcophilus harrisii (Tasmanian Devil)

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information gathered through the Commonwealth's Species Information Partnership with Tasmania, which is aimed at systematically reviewing species that are inconsistently listed under the EPBC Act and the Tasmanian *Threatened Species Protection Act 1995*.

The Tasmanian Devil is listed as endangered under the Tasmanian *Threatened Species Protection Act 1995* and as vulnerable under the EPBC Act. The Committee provides the following assessment of the appropriateness of the species' inclusion in the endangered category in the EPBC Act list of threatened species.

This is the Committee's second consideration of the species under the EPBC Act. The Committee previously considered the species in 2006 and considered it was eligible for listing as vulnerable.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 1 to make it **eligible** for listing as **endangered**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 5 to make it **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **endangered**.

4. Taxonomy

The species is conventionally accepted as *Sarcophilus harrisii* (Tasmanian Devil) (Boitard, 1841).

The name *Sarcophilus lanarius* (Werdelin, 1987) has also been used in recent times in view of comparisons between a fossil specimen named *S. lanarius* (named prior to the naming of *S. harrisii*) and *S. harrisii*. However, *S. lanarius* is not the conventionally accepted name for the species.

5. Description

The Tasmanian Devil is the world's largest surviving marsupial carnivore. The species has a black coat with variable patches of white on its chest, shoulder and rump, and a stocky frame with the fore legs longer than the hind legs. The Tasmanian Devil is a nocturnal hunter and scavenger (Pemberton and Renouf, 1993) and typically weighs between 8 - 14 kg (males) or 5 - 9 kg (females) (Jones, 2008). Hunting often involves covering large distances seeking carcasses and capturing prey. The main prey species are macropods, possums and wombats. Tasmanian Devils are also known to feed socially on larger carcasses (Jones, 2008).

6. National Context

The Tasmanian Devil is endemic to Tasmania and is found throughout the island. It is not found on Tasmania's offshore islands. It was last found on the Australian mainland approximately 430 (+/- 160) years ago (Archer and Baynes, 1973). Its demise on the Australian mainland is thought to have been caused by competition with Indigenous Australians (Johnson and Wroe, 2003) and dingos (Guiler, 1982).

Tasmanian Devils are found in a wide range of habitats, from sea level to all but the highest peaks of Tasmania as well as in forestry plantations and pastures (Jones and Rose, 1996; Jones and Barmuta, 2000). Open forests and woodlands are preferred, while devils are less commonly found in tall or dense wet forests (Jones and Rose, 1996; Jones and Barmuta, 2000). The distribution of the species across Tasmania appears to be continuous, but population densities are lowest in the buttongrass plains of the south-west and highest in the dry and mixed sclerophyll forests and coastal heath of Tasmania's eastern half and north-west coast (Jones and Rose, 1996).

The Tasmanian Devil is listed as endangered under the Tasmanian *Threatened Species Protection Act 1995*.

7. Relevant Biology/Ecology

The Tasmanian Devil matures at approximately two years of age, lives for up to six years in the wild and has an estimated generation length of three years (Jones, 2001). Pemberton (1990) found that Tasmanian Devils occupy several different dens, change dens every one to three days, have overlapping home ranges and travel a mean nightly distance of approximately 9 km.

The Tasmanian Devil is promiscuous and breeds once a year during February to June (DPIW, unpublished data, 2008b). In earlier studies, the mating season was found to occur over a much shorter period, possibly due to limited quantitative sampling. Guiler (1970) described the mating season as primarily occurring from February to March.

Reproductive success is high in wild non-diseased populations, with nearly all females of breeding age (two to four years old) bringing their full complement of four pouched young through to weaning (Pemberton, 1990). Success to maturity of post-weaning individuals is unknown.

Tasmanian Devils are thought to breed and raise their young in traditional dens within underground burrows in wooded terrain (Owen and Pemberton, 2005; Jones, 2008). However, they are also known to utilise logs, den underneath buildings or in thick scrub (Jones, 2008).

During the breeding season there is increasing intra/inter-sexual aggression between males and females prior to and during mating leading to higher injury rates. Devil Facial Tumour Disease (DFTD) is thought most likely to be transmitted between Tasmanian Devils through biting, therefore this is a time of greater potential for disease spread (Hamede et al., 2008).

The Tasmanian Devil is scattered across the whole of mainland Tasmania. However, Jones et al. (2004) identified a genetic distinction between Tasmanian Devils in the western region and the eastern/ south-western regions of the state. Jones et al. (2004) found that Tasmanian Devils had low genetic diversity compared to many Australian marsupials and placental carnivores. This is consistent with the island founder effect and past marked reductions in

population size when Tasmania was isolated from the Australian mainland at the end of the last Ice Age (McCallum et al., 2007). Low levels of genetic diversity can reduce the viability of a population (Eldridge et al., 1999) and increase the susceptibility of a population to disease (Acevedo-Whitehouse et al., 2005).

8. Description of Threats

Devil Facial Tumour Disease (DFTD)

DFTD is an infectious cancer that is restricted to Tasmanian Devils. It was first observed in 1996 and is identified by lesions around a Tasmanian Devil's mouth and head. Small lesions in and around the mouth rapidly develop into large tumours primarily on the face and neck. The cancer is transmitted from devil to devil through biting during fighting or mating (Hamede et al., 2008). Infected devils usually die from starvation (as they find it difficult to eat) and the breakdown of bodily functions. Tasmanian Devils with the disease usually die within three to eight months of the lesions first appearing (DPIW, 2008a).

There are currently sixty three different locations confirmed positive for DFTD across 39 500 km² of eastern and central Tasmania. This represents more than 60% of Tasmania and there is evidence of continued geographical spread of the disease, which is predicted to cover the whole of Tasmania within the next 3-20 years (McCallum et al., 2007). It is estimated that this disease has led to a decline of as much as 64% of the Tasmanian Devil population since the first report of DFTD in 1996. This data has been obtained from spotlighting surveys of Tasmanian Devils across their core historical range, the eastern half of Tasmania, and the northwest region near the coast (DPIW, unpublished data, 2008b). DFTD is associated with local population declines of up to 95% in areas where the disease is present (DPIW, unpublished data, 2008b; Hawkins et al., 2006; McCallum, et al., 2007). These declines were most pronounced in areas where the disease was reported earliest, such as north-eastern and central eastern Tasmania (Hawkins et al., 2006). Consequently, all populations affected by DFTD may have or will be subject to population declines of up to 95% within a ten year period (DPIW, unpublished data, 2008b).

DFTD persists in very low population densities and relies on frequency-dependent transmission suggesting it is likely to cause the extinction of the Tasmanian Devil (McCallum, 2008; McCallum et al., submitted; DPIW, unpublished data, 2008b). Current modelling indicates that there is a strong possibility that the Tasmanian Devil will be extinct within a timeframe of approximately 25-35 years, if trends in DFTD spread and population decline continues (McCallum et al., 2007).

Motor vehicles

Tasmanian Devils favour predictably rich sources of food such as carcasses from roads where they are at risk of being killed by motor vehicles (Jones and Barmuta, 2000). Tasmanian Devils have been trapped at many sites across all 'roaded' areas of Tasmania and these areas closely match the core distribution of the species. In some cases, the construction of roads, and the subsequent availability of carrion, may have assisted the spread of the Tasmanian Devil and increased the population size of the species. However, local road-kill impacts documented at Cradle Mountain and Freycinet National Parks across a seventeen month period (Jones, 2000; Jones, pers. comm., 2008) and a recent three year study (2001–2004) of road-kill frequency on the main roads of Tasmania, estimated that 3392 Tasmanian Devils were being killed annually (Hobday and Minstrell, 2008). This suggests that between 3.8 and 5.7 percent of the Tasmanian Devil's total population is killed on roads each year.

Foxes

There have been irregular, limited introductions of the red fox (*Vulpes vulpes*) into Tasmania since early European colonisation. Early introductions often represented efforts of early settlers to acclimatise, or for hunting or other unknown reasons. In recent times, there was one accidental introduction (from a ship in 1998), and deliberate introductions of 12 and 19 foxes in 1999 and 2000 respectively (Saunders et al., 2006). Evidence of fox scats, carcasses and blood has been identified in the northwest and northern midlands and southern midlands (Saunders et al., 2006, Berry et al., 2007, DPIW, 2008c). Reliable sightings of foxes have occurred on the eastern side of the state as well as the central highlands and far northwest (DPIW, 2008c).

Foxes are a potential threat to Tasmanian Devils if fox numbers increase substantially, as foxes will compete with Tasmanian Devils for food resources, habitat and den sites. It is likely that the abundance of Tasmanian Devils has prevented the establishment of foxes in Tasmania as Tasmanian Devils compete with foxes including killing adult foxes and denning juveniles. It is also considered likely that foxes would compete directly with Tasmanian Devil juveniles. Both species have similar requirements for den sites and habitat and are of a comparable size. Where Tasmanian Devils are in greater abundance than foxes, the establishment of foxes is likely to be slowed or prevented. With Tasmanian Devil numbers reduced by DFTD, food availability for foxes will be increased, enhancing conditions for fox establishment. A major food source for Tasmanian Devils is carrion, which is also preferred food for foxes. If fox numbers increase substantially this could also have a detrimental effect on the survival and recovery of the Tasmanian Devil (DPIW, 2008c).

Deliberate culling by humans

In the past, deliberate culling of Tasmanian Devils by humans led to a significant decline in population numbers in Tasmania. As recently as the 1990s, control permits were occasionally issued to individuals who considered that Tasmanian Devils were acting as pests. Deliberate culling of Tasmanian Devils by humans is currently limited but can be locally intense (Mooney, pers. comm., 2009). The Tasmanian Devil has been protected in Tasmania since 2002 and is listed as an endangered species under the Tasmanian *Threatened Species Protection Act 1995*. While some culling of Tasmanian Devils is likely to persist, it is not considered a major threat to the species unless Tasmanian Devil populations become very small and fragmented (DPIW, unpublished data, 2008b).

Habitat modification

Given that Tasmanian Devils are highly mobile and can be considered generalists in terms of their habitat preferences, they are less susceptible to habitat modification than many other species. However, if Tasmanian Devil densities become very low there is a risk that disturbance or destruction of maternal dens, as a result of land clearance, such as for urban development, forestry and agriculture, could pose a significant threat to the Tasmanian Devil (Owen and Pemberton, 2005). Where densities become very low, it is possible that disturbance or destruction of maternal dens will have a detrimental affect on breeding success (Owen and Pemberton, 2005). Female Tasmanian Devils in areas where DFTD is present typically only have one or two litters per lifetime as opposed to three or four litters in disease free areas (Jones et al., 2008; Jones, 2008). For many species, sites suitable for denning can be limited across the landscape (Dunwell and Killingley, 1969; Parer and Libke, 1985). The destruction of dens in areas where dens are sparsely available and where DFTD has been present for a relatively long period of time, may have the potential to push Tasmanian Devils more rapidly to local extinction.

9. Public Consultation

As the information for this assessment was recently completed by the Department of Primary Industry and Water (DPIW), no public consultation has yet taken place. The Department will undertake public consultation on the Committee's behalf following the December 2008 meeting. If no comments are received, the Department will submit the Committee's listing advice to the Minister. If comments are received, the Department will submit those along with revised listing advice to the Committee.

10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **eligible** for listing as **endangered** under the EPBC Act. The assessment against the criteria is as follows:

Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers

Population estimates for the Tasmanian Devil, based on statewide hair tubing surveys and modelling work, were undertaken in the early to mid 1990s. These estimates indicated a total population size of mature individuals ranging from 65 000 to 75 000 individuals (Jones and Rose, 1996).

Statewide roadside spotlight surveys of Tasmanian Devils show significant population declines across the state since the emergence of DFTD in the mid-1990s. Trapping of Tasmanian Devils also supports this conclusion. Total population declines of the Tasmanian Devil since the mid 1990s have been estimated at: 27% by early 2004, 41% by early 2006, 53% by early 2007 (Hawkins et al., 2006; McCallum et al., 2007), and 64% by early 2008 (DPIW, unpublished data, 2008b). In addition, it is predicted that the species will have declined by a further 70% or more in the next 10 years with extensive local extinctions also occurring (McCallum, pers. comm., 2008).

The decline was notably sharper in regions where DFTD had been present longest, such as in north-eastern Tasmania where mean sightings had declined by 95% from 1992-1995 to 2005-2007. Currently, there is no sign of this decline abating and there is no effective treatment, vaccine or cure for DFTD (DPIW, unpublished data, 2008b). Examination of mark-recapture data in the same area from the mid-1980s and 2007 supports this finding (McCallum et al., 2007; Lachish et al., 2007). Trapping from 1999 to 2007 on the Freycinet Peninsula, on the east coast of Tasmania, has revealed a total population decline of at least 60% since DFTD was first identified on the peninsula in 2001 and the adult population continues to halve annually (Lachish et al., 2007).

Based on the population estimates from the mid 1990's, a 64% decline in population numbers equates to the 2007 population size being an estimated 25 000 mature individuals (50 000 individuals including juveniles). A 2004 study using mark-recapture survey data estimated a total population size of approximately 21 000 mature individuals (Hawkins et al., 2006). Extrapolating from this to estimate the 2007 population size (based on a decline of 64%) equates to a population size of 10 000 mature individuals (DPIW, unpublished data, 2008b). Therefore, the best estimate of the total population size of mature individuals, based on these two studies is in the range of 10 000 to 25 000 individuals (DPIW, unpublished data, 2008b).

DFTD persists in very low population densities and relies on frequency-dependent transmission suggesting it is likely to cause the extinction of the Tasmanian Devil (McCallum, 2008; McCallum et al., submitted; DPIW, unpublished data, 2008b). It is also likely that the disease will continue to spread across the species entire geographic distribution within a timeframe of 3-20 years, as it has an average rate of spread of 7-10 km per year (McCallum, pers. comm., 2008). On this basis, and the identification of local population declines of up to 95% where DFTD is present (DPIW, unpublished data, 2008b), McCallum et al. (2007) predict that the extinction of the Tasmanian Devil within a timeframe of 25-35 years is a strong possibility, if trends in DFTD spread and population decline continues.

As discussed in section 8, there are a variety of threats affecting the Tasmanian Devil including DFTD, motor vehicles, foxes, culling and habitat modification.

In summary, DFTD in particular is having a significant impact on the Tasmanian Devil which has suffered an estimated decline in numbers of 64% from the mid 1990's to 2008. It is predicted that the species will have declined by a further 70% or more in the next 10 years with extensive local extinctions also occurring. There is currently no effective treatment, vaccine or cure for DFTD. DFTD has now been identified across more than 60% of the species' geographic distribution and local population declines of up to 95% have been observed. Current modelling indicates that there is a strong possibility that the Tasmanian Devil will be extinct within a timeframe of approximately 25-35 years, if trends in DFTD spread and population decline continues. The Committee judges that the reduction in population numbers of the Tasmanian Devil has been severe and will continue to be severe in the immediate future. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited

The Tasmanian Devil is found throughout Tasmania with the exception of Tasmania's offshore islands. The species' extent of occurrence is equivalent to the area of mainland Tasmania (around 64 000 km²) (Jones and Rose, 1996). As the species' distribution is continuous across this area, the species' estimated area of occupancy is also around 64 000 km².

Hawkins et al. (2006) analysed Tasmanian Devil sightings from spotlighting surveys conducted annually across different areas of Tasmania since the first reports of DFTD in 1996. The most dramatic declines in sightings occurred in the area of eastern Tasmania (approximately 24 000 km²) across which disease symptoms had been reported prior to 2003. If these declines continue at the same rate, an extrapolation of documented local declines indicates that Tasmanian Devils may become extinct from this area within ten years. On this basis, the extent of occurrence may contract by 24 000 km² (i.e. to 40 000 km² or less in the next 5 - 10 years). It is conceivable that similar declines might develop across the entire 39 500 km² area currently known to be affected by the disease, leading to a contraction of the extent of occurrence to 31 000 km². The species' area of occupancy would similarly contract to 40 000 km² or less in the next 5 - 10 years if DFTD persists in very low population densities as suggested by McCallum (McCallum in press; McCallum et al., submitted; DPIW, unpublished data, 2008b). It is also likely that the disease will continue to spread across the species' entire geographic distribution, as it has an average rate of spread of 7-10 km per year (McCallum, pers. comm., 2008). On this basis, and the identification of local population

declines of up to 95% where DFTD is present, McCallum et al., (2007) predict that the extinction of the Tasmanian Devil within a timeframe of 25-35 years is a strong possibility, if trends in DFTD spread and population decline continues.

However, up to 2008, although there have been severe declines in numbers there is no evidence indicating any significant recent changes in either the species' extent of occurrence or its area of occupancy and no local population extinctions have been documented.

The Committee does not consider that the species' geographic distribution is both precarious for the survival of the species and very restricted, restricted or limited. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 2, it is **not eligible** for listing in any category under this criterion.

Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either
(a) evidence suggests that the number will continue to decline at a particular rate; or
(b) the number is likely to continue to decline and its geographic distribution is precarious for its survival

Based on evidence available in 2008, the total number of mature individuals of Tasmanian Devils is within the range of 10 000 to 25 000 mature individuals (DPIW, unpublished data, 2008b). Consequently, the total number of mature individuals is not considered to be limited. However, these figures are much lower than population estimates of the mid 1990s. These estimates indicated a total population size of mature individuals ranging from 65 000 to 75 000 individuals (Jones and Rose, 1996). These figures represent a decline in the Tasmanian Devil population of 64% since the mid 1990's (DPIW, unpublished data, 2008b).

Statewide spotlighting surveys since the mid 1990's have shown a consistent decline in Tasmanian Devil numbers as follows: 27% by early 2004, 41% by early 2006, 53% by early 2007 (Hawkins et al., 2006; McCallum et al., 2007), and 64% by early 2008 (DPIW, unpublished data, 2008b). In addition, it is predicted that the species will have declined by a further 70% or more in the next 10 years (McCallum, pers. comm., 2008). This suggests that the number of mature individuals is likely to continue to decline, at least at the above rate, into the future unless a treatment, vaccine or cure is found for DFTD. Current modelling indicates that there is a strong possibility that the Tasmanian Devil will be extinct within a timeframe of approximately 25-35 years, if trends in DFTD spread and population decline continues (McCallum et al., 2007).

While the number of mature individuals is likely to continue to decline, the Committee does not consider that the estimated total number of mature individuals of the species is limited to a particular degree. Therefore, the species is **not eligible** for listing under this criterion.

Criterion 4: The estimated total number of mature individuals is extremely low, very low or low

The total number of mature individuals is estimated to be within the range of 10 000 to 25 000 individuals (DPIW, unpublished data, 2008b).

The Committee does not consider that the estimated total number of mature individuals of the species is extremely low, very low or low. Therefore, as the species has not been demonstrated to have met any required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

Criterion 5: Probability of extinction in the wild that is at least:

- a) **50% in the immediate future; or**
- b) **20% in the near future; or**
- c) **10% in the medium-term future.**

McCallum et al. (2007) utilised mark-recapture analysis and a preliminary epidemiological model to predict local extinctions of the Tasmanian Devil on the Freycinet Peninsula in Tasmania. This modelling predicts local extinction of the Tasmanian Devil on the Freycinet Peninsula over a timeframe of 10–15 years from the disease’s first emergence on the Peninsula in 2001. Extrapolation of this data to the entire Tasmanian Devil population indicates that there is a strong possibility that the Tasmanian Devil will be extinct within a timeframe of approximately 25-35 years, if trends in DFTD spread and population decline continues (McCallum et al., 2007). This modelling is based on data that indicates that DFTD is currently spreading at an average rate of spread of 7-10 km per year (McCallum, pers. comm., 2008), is causing local declines of up to 95% and is predicted to cover the whole of Tasmania within the next 3-20 years (DPIW, unpublished data, 2008b; McCallum et al., 2007). This equates to a greater than 10% probability of extinction in the wild in the medium-term future. Given the current threat posed by DFTD to the Tasmanian Devil and data that indicates devils are known to travel up to 25 km per night (Jones, pers. comm., 2008), these predictions may be considered conservative, however the modelling does not provide an estimate of extinction risk in a shorter timeframe.

The Committee considers that the estimated probability of the species’ extinction in the wild is at least 10% in the medium-term future. Therefore, the species has been demonstrated to have met the required elements of Criterion 5 to make it **eligible** for listing as **vulnerable**.

11. CONCLUSION

Conservation Status

This advice follows assessment of information gathered through the Commonwealth’s Species Information Partnership with Tasmania, which is aimed at systematically reviewing species that are inconsistently listed under the EPBC Act and the Tasmanian *Threatened Species Protection Act 1995*.

DFTD is having a significant impact on the Tasmanian Devil which has suffered an estimated decline in the species numbers of 64% from the mid 1990s to 2008. It is predicted that the species will have declined by a further 70% or more in the next 10 years with extensive local extinctions also occurring. There is currently no effective treatment, vaccine or cure for the disease. DFTD has now been identified across more than 60% of the species’ geographic distribution and local population declines of up to 95% have been observed. The Committee judges this reduction to have been severe and will continue to be severe in the immediate future. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

Current modelling indicates that there is a strong possibility that the Tasmanian Devil will be extinct within a timeframe of approximately 25-35 years, if trends in DFTD spread and population decline continues. This modelling is based on data that indicates that DFTD is currently spreading at an average rate of spread of 7-10 km per year, is causing local declines of up to 95% and is predicted to cover the whole of Tasmania within the next 3-20 years. The Committee considers that the estimated probability of the species’ extinction in the wild is at least 10% in the medium-term future. Therefore, the species has been demonstrated to have met the required elements of Criterion 5 to make it **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **endangered**.

Recovery Plan

The Committee considers that there should be a recovery plan for this species as abatement of the primary threat of Devil Facial Tumour Disease requires a high level of planning and co-ordination with a variety of stakeholders.

12. Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **transferring** from the **vulnerable** category to the **endangered** category:

Sarcophilus harrisii (Tasmanian Devil)

- (ii) The Committee recommends that there should be a recovery plan for this species.

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FEIANZ
Chair
Threatened Species Scientific Committee

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